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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/832,978	04/12/2001	Hideo Kitagawa	35.C15293	9731

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EXAMINER

OLSEN, ALLAN W

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 01/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/832,978	Applicant(s) KITAGAWA ET AL.	
	Examiner Allan W Olsen	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-12 and 15-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-12 and 15-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless —

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 7, 11 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,868, 951 issued to Schuck, III et al. (hereinafter, Schuck).

Schuck teaches depositing a hard mask layer over a polymeric layer such as BCB. Schuck teaches patterning the hard mask layer by etching through an overlying patterned photoresist. Schuck teaches transferring the mask pattern into the underlying polymer by etching through the patterned hard mask. Schuck teaches that Al and Cu are materials that are known as having been used for the hard mask. See: figure 4A; column 9, lines 8-15, 38-45; column 11, lines 11-31.

Claims 1, 7, 11 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Published U.S. Patent Application 2003/0209515 of Pavelchek (hereinafter, Pavelchek).

Pavelchek teaches depositing an aluminum comprising hard mask layer (14) over an organic layer (12). Pavelchek teaches patterning the hard mask layer by

etching through an overlying patterned photoresist (step 4, fig.1). Pavelchek teaches transferring the mask pattern into the underlying polymer by etching through the patterned hard mask (step 5, figure 1). See figure 1 and paragraphs [0012], [0016], [0017], [0025], [0030], [0031], [0052]-[0054] and [0058].

Claims 1, 9, 11 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,534,462 issued to Fiordalice et al. (hereinafter, Fiordalice).

Fiordalice teaches etching a layer of TEOS (tetra-ethyl-ortho-silicate) through a patterned hard mask of aluminum nitride. See column 3, lines 25-29 and column 7, lines 3-51).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 6-8, 10-12, 15 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,037,255 issued to Hussein et al. (hereinafter, Hussein) in view of Schuck.

Hussein teaches a method of patterning an organic dielectric layer (103). Hussein teaches applying a patterned photoresist to a hard mask layer (104) that overlies the organic dielectric. Hussein teaches patterning the hard mask layer in order

to expose a portion of the underlying dielectric so that the exposed portion of the dielectric can be removed by etching with a plasma comprising N_2 and H_2 . Hussein teaches the organic layer is a polymer. Hussein teaches the use of low k dielectric polymers such as FLARETM and polyarylethers (column 2, line 57 - column 3, line 6). Hussein teaches that the hard mask may be any material that is capable of protecting the underlying dielectric layer (column 3, lines 49-52).

Hussein does not teach using a hard mask comprising aluminum and/or copper.

It would have been obvious to one skilled in the art to use aluminum or copper as the material of the hard masking because Hussein teaches than any material capable of functioning in the capacity of a hard mask may be used and Schuck teaches that it was known in the prior art to use aluminum and/or copper as a hard mask.

Claims 5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hussein in view of Schuck as applied to claims 1 and 11 above and further in view of Suzuki et al. in EP 0880164 (hereinafter, Suzuki).

Hussein/Schuck does not teach using a surface-wave interfered plasma.

Suzuki teaches using a surface-wave interfered plasma.

It would have been obvious to one skilled in the art to use a surface-wave interfered plasma because Suzuki teaches that this provides a uniform high density plasma over a large area. Additionally a higher quality plasma processing can be accomplished at lower temperatures over a wider pressure range (column 4).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Nulty (US 5,562,801) and Hara (US 6,495,466) teach an AI hard mask. The instant claims, in part, may be rejected under 35 U.S.C. 102 over Gilbert et al. (US 6,635,528). However, in view of the foregoing rejections, Gilbert is not relied upon at this time.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills, can be reached on 571-272-1439.

Art Unit: 1763

The fax number for TC1700 is 703-872-9306 (non-after finals and after-final).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-1300.

Allan Olsen, Ph.D.
January 19, 2004

Allan Olsen
P. Examiner